Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc. (Blended)

(2019 Course)

Course Code : Maths 101

Course Name : Calculus

Teaching Scheme: TH: 5 Hours/Week, TUT : 1 Hr/Wk. **Credit : 04**
Examination Scheme: CIA : 50 Marks **End-Sem : 50 Marks**

Prerequisites:

- Limit, Continuity, Differentiation, Integration

Course Objectives:

- To Study applications of Differentation
- To Study applications of Integration

Course Outcomes:

On completion of the course, student will be able to–

- Find Partial derivatives, Directional derivatives, Extrema of Functions
- Solve Riemann integration, improper integration
- Solve First and second order differential equations.

Semester I

Course Contents

Chapter 1	Differential Calculus	12 Lectures
	• Graphs of functions of one variable • Trigonometric Functions and their inverses, • derivatives of inverse trigonometric functions, • implicit differentiation, • related rates. • Partial derivatives, • Higher Order Partial Derivatives, • Chain rule for partial derivatives, Directional derivatives, • Application of Partial Derivatives- tangent planes, Normal Line, Extrema for functions of several variables and double integrals,	
Chapter 2	Integral Calculus	12 Lectures
	• Fundamental theorem of calculus, • integration by trigonometric and algebraic substitutions, • use of partial fractions with application to areas and volumes., • Riemann integration, • further techniques of integration and applications, • Improper integrals	
Chapter 3	Differential Equations	12 Lectures

	• First order differential equations-Linear Equations, Separable Equations, Exact Equations, • Second Order Differential Equations - Homogeneous and Nonhomogeneous, Second order linear differential equations with constant coefficients	

References:

1. Mathematical Analysis by S.C. Malik and Savita Arora, New Age International Private Limited (Fifth Edition), 2017
2. Ordinary and partial differential equations by Dr. M. D. Raisinghania, S. Chand (18^{th} Edition), 1976

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5
First Year of B.Sc.Blended (Biosciences)
(2019 Course)

Course Code: PHY 101
Course Name: Physics 1: Introductory Classical Physics

Teaching Scheme: TH: 3 Hours/Week **Credit: 03**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses:

- Kinematics, equation of motion, elasticity,waves and oscillations, fluid mechanics, geometrical optics

Course Objectives:

- Students will be given the basic information of introductory classical physics, waves, gravitation

Course Outcomes:

On completion of the course, student will be able to–

- Apply the basic knowledge of classical mechanics in day to day life

Semester I

Course Contents

Chapter-1	Classical mechanics	10 Lectures
	• Newton's laws of motion. • Momentum and impulse. • Translational, vibrational and rotational energy. • Simple harmonic motion. • Rigid body rotations • Applications to biological and physical systems	
Chapter-2	Waves and oscillations	8 Lectures
	• Reflection, refraction, superposition, • Resonance, energy transport, absorption, • Doppler effect. • Applications to water waves, acoustics, seismology	
Chapter-3	Gravitation	6 Lectures
	• Newton's law of gravity, • Kepler's Laws. • Applications to astrophysics including orbital motion, escape velocity, apparent weightlessness	
Chapter-4	Fluids	6 Lectures
	• Pressure, • Buoyancy • Fluid flow • Viscosity • Surface tension • Applications to hydraulics, biophysics, atmospheric physics, aerodynamics	
Chapter-5	Optics	6 Lectures
	• Geometrical optics • Dispersion, • Lenses, mirrors, • Interference,	

	• Diffraction, • Polarisation. • Applications to microscopy, imaging, vision, crystallography	

References:

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: CHM 101

Course Name: General and Organic Chemistry

Teaching Scheme: TH: 3 Hours/Week **Credit: 03**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic chemistry from XI & XII Science.

Course Objectives:

- To Study Basics of chemistry
- important reactions which will help various processes in biological system
- To study importance of pH and buffer in chemical and biochemical reactions
- To understand chemical kinetics of chemical and biochemical reactions
- To expertize students in biochemical calculations

Course Outcomes:

On completion of the course, student will be able to–

- Study all basic fundamentals of chemistry
- Can extend their analytical thinking in research field.

Semester I

Course Contents

General Chemistry		
Practicals	Title	No. of Practicals
Practical-1	The Periodic Table	1 Lecture
Practical-2	Molecular Structure and Bonding	2 Lectures
	• Lewis structures Formal charge Resonance • VSEPR – predicting the shapes of molecules Polarity of molecules • Covalent Bonding valence bond theory (Localized Electron model) • Molecular orbital theory • Intermolecular forces	
Practical-3	Water	1 Lecture
	• The biological solvent Physical characteristics and chemical properties	
Practical-4	Carbon – the basis of life	1 Lecture
Practical-5	3D molecular structure and isomerism	1 Lectures
	• Isomerism • Stereoisomerism	
Chapter-6	Small inorganic molecules of biological importance	1 Lectures
	• Phosphates and phosphoric acid • Nitrogen • Oxygen	
Chapter-7	Acids and Bases	2 Lectures
	• The Nature of Acids and Bases • Lowry Bronsted Theory	

	• Lewis Acids/Bases • Dissociation of Carboxylic Acids • Amine Basicity • Acid Strength • The pH Scale • Calculating the pH of Strong Acid Solutions • Calculating the pH of Weak Acid Solutions • Bases • Strategy for Solving Acid-Base Problems: A Summary • Buffers • Polyprotic acids • Gas solubility	
Chapter-8	Stoichiometry	1 Lecture
Chapter-9	Chemical Kinetics	2 Lectures
	• Reaction Rates Rate Laws: An Introduction • Determining the Form of the Rate Law • The Integrated Rate Law Rate Laws: A Summary • Reaction Mechanisms • The Steady-State Approximation • A Model for Chemical Kinetics • Catalysis	
Chapter-10	Chemical Equilibrium	2 Lectures
	• The Equilibrium Condition • The Equilibrium Constant • Equilibrium Expressions Involving Pressures • Heterogeneous Equilibria • Applications of the Equilibrium Constant • Solving Equilibrium Problems	
Organic Chemistry		
Chapter-1	Structure and Bonding Alkanes(sp3 Hybridisation)	2 Lectures
	• Covalent bonding - H 2 • S-bonding and sp3 hybridisation in methane and ethane 3 • Structural isomerism • Methane, ethane, nomenclature of saturated hydrocarbons • Conformational isomerism: ethane, butane • Stereochemistry, Optical activity, enantiomers and their physical/chemical properties. Racemates. • Designation of absolute configuration • Diastereoisomers • Meso compounds • Cycloa1lkanes • Conformational isomerism of cyclohexanes	
Chapter-2	Structure and Bonding Alkenes(sp2 Hybridisation)	2 Lectures
	• sp hybridisation, s and p bonding in ethene • Nomenclature of alkenes • Geometrical isomerism • Conjugated alkenes	
Chapter-3	Benzene and its derivatives	1 Lecture
	• Kekulé structures/resonance • Nomenclature of substituted benzenes	
Chapter-4	Structure and Bonding of Alkynes (sp hybridisation)	1 Lecture

	• sp hybridisation, s and p bonding in ethyne • Nomenclature of alkynes	
Chapter-5	Functional Groups	1 Lecture
	• Haloalkanes • Alcohols • Ethers • Amines • Carbonyl compounds • Carboxylic acids and derivatives	
Chapter-6	Electrophiles and Nucleophiles	2 Lectures
	• Arrow conventions • Organic acids and bases • Strengths of acids and bases: electronegativity, hybridisation, resonance	
Chapter-7	Nucleophilic substitution reactions	1 Lecture
	• Nucleophiles and electrophiles SN1 and SN2 reactions • Determination of mechanism by stereochemical and kinetic methods • Properties of good leaving groups • Properties of good nucleophiles	
Chapter-8	Elimination reactions	1 Lecture
	• E1 and E2 reactions • Determination of mechanism by stereochemical and kinetic methods • Dehydration of alcohols	
Chapter-9	Addition reactions	1 Lecture
	• Markovnikov's rule • Hydration of alkenes	
Chapter-10	Electrophilic aromatic substitution reactions	1 Lecture
	• Substitution reactions of benzene: halogenation, nitration, sulfonation, Friedel-Crafts acylation and alkylation	
Chapter-10	Nucleophilic addition reactions	1 Lecture
	• Addition to carbonyl groups by cyanide, Grignard reagents, acetylide anions • Synthesis and chemistry of acids, amides, esters, acyl chlorides and anhydrides	
Chapter-11	Organic redox reactions	1 Lecture
	• Reductions: Catalytic hydrogenation, hydride reagents • Oxidations: Benzylic oxidation • Oxidation of primary alcohols to aldehydes then carboxylic acids by Cr(VI) reagents • Oxidation of secondary alcohols to ketones by Cr(VI) reagents	
Chemistry of life		
Chapter-1	Stereochemistry and Biomolecular chirality	2 Lecures
Chapter-2	Concatenation and Biopolymers	5 Lecures
	• Polypeptides • NucleicAcids • Lipids • Sugars • Cellulose • Isoprenes and Turpenoids	

References:

- Stereochemistry: Conformation and mechanism by P.S.Kalsi
- Organic chemistry by Jonathan clayden, nick greeves and stuart warren
- University General Chemistry , 1st edition (2000), C.N. R. Rao, Macmillan Publishers, India ,
- 2. Principles of Physical Chemistry, 4th edition (1965), S.H. Maron and C.F. Prutton, Collier Macmillan Ltd 3. The elements of Physical Chemistry, 5th edition (2009), Atkins P, de Paula J. , W. H. Freeman Publication, USA
- 4. An Introduction to Electrochemistry , edition reprint, 2011, Samuel Glasstone, BiblioBazaar, USA
- 5. Physical Chemistry for biological sciences, 1st edition, (2005), Chang R., University Science Books, USA 6. Physical Chemistry, 1st edition, (2003) David Ball, Thoson Learning, USA.
- 7. Essentials of Physical Chemistry, 24th edition, (2000), B S Bahl, G D Tuli, ArunBahl, S. Chand Limited, India.
- 8. Concise Inorganic Chemistry. 5th edition (2008), Author: J. D. Lee, John Wiley & Sons, USA.
- 9. Organic Chemistry, 6 th edition, (1992), Morrison Robert Thornton, Pearson Publication, Dorling Kindersley (India Pvt. Ltd.)
- 10. Guide book to Mechanism in Organic Chemistry by Peter Sykes, 6 th edition, (1996), Prentice Hall, India.

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Biology 101

Course Name: Evolution and Diversity of life

Teaching Scheme: TH: 3 Hours/Week **Credit: 03**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Semester I

Course Contents:

Chapter-1	Unifying themes in Biology	4 Lectures
	• Cell theory and the origin of life (Cell theory, living organisms are made of cells, cells are smallest organizational unit of life, origin of life=origin of cell; life is defined by replication, mutation, metabolism • Chemical evolution of life (RNA polymers and the origins of information storage and replication, containment of molecules in cell-like compartments, DNA as the basis for life) • Life evolves Evolution and natural selection Evolution of complexity Unicellular to multicellular Structuralorganization – symmetrical and asymmetrical	
Chapter-2	Domains and kingdom of life	2 Lectures
	• Five kingdoms model; the tree of life	
Chapter-3	Diversity, structure and biology of major groups	24 Lectures
	• Emphasizing the major evolutionary features and the evolution of body plans • Prokaryotes: Bacteria and Archaea • Protists (Slime moulds, amoebae, primary plastids – red and green algae, secondary plastids – brown algae lineage, dinoflagellates and apicomplexans, euglenoids) • Fungi (Structure and growth, nitrition, reproduction, fugal phyla, mutualisms, fungi and humans) • Plants (Alternation of generations and the land plant life cycle, bryophytes, evolution of vascular tissue, lycophytes and ferns, seed plants, the seed and secondary growth, cycads and Ginkgo, conifer diversity and biology, Angiosperm structure, biology and diversity, the flower, double	

	fertilization. • Animals (Simple animals – sponges to flatworms; annelids, molluscs, nematodes and arthropods; echinoderms; chordates	
Chapter-4	Viruses and Prions	2 Lectures
	• Viruses are subcellular organisms	

References:

1. Reece, Taylor, Simon and Dickey - Campbell Biology: concepts and connections, 7th Edition, Pearson Education (Singapore) Pvt. Ltd.
2. General Zoology - By Goodnight and others, IBH Publishing Co.,
3. R.L. Kotpal, 10th Edition.,2009 - Modern text book of Zoology, Invertebrates, Rastogi publications, Meerut.
4. Parker J. and Haswell, W., - Text-Book of Zoology, ELBS Edition.
5. Cleveland Hickman Jr., Larry Roberts, Susan Keen, Allan Larson and David Eisenhour - Animal Diversity, 8th Edition, McGraw Hill Publication.
6. Das, Datta and Gangulee - College Botany (Vol I), Published by New Central Books Agency (P). Ltd.
7. V. Verma - Botany, 2010, Ane Books Pvt Ltd.
8. A.C. Dutta - Botany for Degree Students, 6th Edition, Oxford University Press, New York.
9. Richard S.K. Barnes - The Diversity of Living Organisms, John Wiley and Sons Ltd., Oxford, United Kingdom.
10. Lynn Margulis and Michael J. Chapman - Kingdoms and Domains:An Illustrated Guide to the Phyla of Life on Earth, 4th edition,Academic Press; (1st edition in January 26, 2009).
11. Brian K. Hall; BenediktHallgrímsson - Strickberger's Evolution, Fourth Edition, Jones and Bartlett Publishers, Inc.
12. Mark Ridley, 2004, 3rd Edition - Evolution, Blackwell Publishing.
13. Carl T. Bergstrom & Lee Alan Dugatkin - Evolution (second edition), W. W. Norton & Company; Second edition.
14. Douglas J. Futuyma - Evolution, 2nd/ 3rd Edition,Sinauer Associates.

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc. (Blended)

(2019 Course)

Course Code: MTH 102

Course Name: Algebra

Teaching Scheme: TH: 5 Hours/Week, TUT: 1 Hr/Wk. **Credit: 04**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisites:

- Limit, Matrices

Course Objectives:

- To Study arithmetic of Complex numbers
- To Study Mean Value Theorems
- To study Vector spaces
- To study Vectors

Course Outcomes:

On completion of the course, student will be able to–

- Find roots of the polynomials in Complex Numbers
- Solve System of linear equations using matrices
- Know about Mean Value theorems and its applications
- Know about Scalar and Vector projections
- Find Basis of vector spaces

Semester I

Course Contents:

Chapter 1	Differential Calculus	8 Lectures
	• Limits of Real Valued Functions • Continuity and differentiability • Mean value theorem and its applications • Taylors polynomials • Sequences and infinite series	
Chapter 2	Vectors	8 Lectures
	• Basics,Magnitude, • Unit Vector, Arithmetic, • Dot product, • Cross Product • Scalar Triple product • Scalar and vector projections, • plane curves specified by Vector Equations	
Chapter 3	Complex Numbers	10 Lectures
	• Arithmetic of complex numbers-addition, subtraction, multiplication,	

	division, • Sketching regions in the complex plane, • De-Moivre's Theorem, • Roots of polynomials • The fundamental theorem of Algebra	
Chapter 4	Linear Algebra	10 Lectures
	• System of linear equations • Matrices and determinant • Vectors in Real n-spaces • Vector Spaces • Linear independence • Basis • Eigen values and eigen vectors	

References:

- Mathematical Analysis by S.C. Malik and Savita Arora, New Age International Private Limited (Fifth Edition), 2017
- Linear Algebra by Kumerason, PHI Learning, 2000
- Schaum's Outline Series, McGraw Hill Education(Second Edition), 2017

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: PHY 102

Course Name: Electricity and Magnetism

Teaching Scheme: TH: 3 Hours/Week **Credit: 03**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses:

- Kinematics, equation of motion, elesticity,waves and oscillations, fluid mechanics, geometrical optics

Course Objectives:

- Students will be given the basic information of electricity, magnetism and quantum mechanics

Course Outcomes:

On completion of the course, student will be able to–

- Apply the basic knowledge of classical mechanics in day to day life

Semester II

Course Contents

Chapter-1	Electricity and magnetism	18 Lectures
	• Electric charge and field • Conductors and insulators • Electric potential • Capacitance • Resistance • Electric circuits • Magnetic field • Biot-Savart law • Faraday's law of induction • Maxwell's equations • Electromagnetic waves	
Chapter-2	Special relativity	6 Lectures
	• Frame transformations • Relativity of space and time • Modification of classical mechanics, • Mass-energy equivalence.	
Chapter-3	Quantum physics	6 Lectures
	• Photons • Blackbody radiation • Matter waves • Quantisation in atoms • Interaction of light with matter • x-rays.	
Chapter-4	Nuclear physics	6 Lectures
	• Atomic nucleus • Radioactive decay • half-life • Ionising radiation	

	• Nuclear fission and fusion. • Nuclear energy • radiation safety • nucleogenesis,	

References:

- 'The Feynman lectres' by Feynman
- TY BSc texyt book, Nirali publications
- Principles of physics by Halliday, Resnick and Walker
- S.Y.BSc mathematical methods in Physics, Nirali publications
- Concepts of modern physics by Arthur Beiser

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: CHM102

Course Name: Physical and Inorganic chemistry

Teaching Scheme: TH: 3 Hours/Week **Credit: 3C**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic chemistry from XI & XII Science.

Course Objectives:

- To Study Basics of chemistry
- important reactions which will help various processes in biological system

Course Outcomes:

On completion of the course, student will be able to–

- Study all basic fundamentals of chemistry
- Can extend their analytical thinking in research field.
- To study thermodynamics of various biochemical reactions

Semester II

Course Contents

1	**Physical Chemistry**	
Chapter-1	Gases, Kinetic theory	4 Lecture
	• Early Experiments • The Gas Laws of Boyle, Charles and Avogadro • The Ideal Gas Law • Gas Stoichiometry • Dalton's Law of Partial Pressures • Collisions of Gas Particles with the Container Walls • Intermolecular Collisions • Real Gases • Chemistry in the Atmosphere	
Chapter-2	Thermodynamics •	4 Lectures
	• The Nature of Energy • Enthalpy • Thermodynamics of Ideal Gases • Calorimetry • Hess's Law • Standard Enthalpies of Formation	
Chapter-3	Spontaneity, Entropy and Free Energy	2 Lectures
	• Spontaneous processes • Entropy • The 2nd law of thermodynamics • Free energy • Free energy and equilibrium	
Chapter-4	Spectroscopy and Determination of Structure	3 Lectures
	• The EM Spectrum • Mass spectrometry / combustion analysis information available from molecular formulae	

	• Infrared spectroscopy • Nuclear magnetic resonance spectroscopy: 1H and 13C	
Chapter-5	Elementary quantum theory	2 Lectures
Inorganic chemistry		
Chapter-1	Ionic Compounds and their Solutions	2 Lectures
	• Ions: electron configurations and sizes • Lattice energy • Solubility equilibria and solubility products	
Chapter-2	Structures of Solids	3 Lectures
	• X-ray diffraction • Metallic bonding • Sphere packing models • Structures of metals • Structures of ionic compounds • Silicates	
Chapter-3	Main Group Chemistry	4 Lectures
	• Structures of the elements • Chemistry of main group compounds	
Chapter-4	Redox reactions and electrochemistry	4 Lectures
	• Galvanic cells and a quantitative treatment of standard reduction potential • Concentration dependence of reduction potential - Nernst equation - Concentration cells - Equilibrium constants - Solubility constants Batteries - Primary, secondary fuel cells • Corrosion - Overpotential • Electrolysis	
Chapter-5	The transition metals : a survey	1 Lecture
	• Electron configurations • Oxidation states and ionisation energie • Reduction potentials First-row transition metals • Ores and extraction of the metal Stable oxidation states	
Chapter-6	Coordination Chemistry	4 Lectures
	• Coordination compounds • Oxidation number • coordination number • Lewis acid-Lewis base interaction • Ligands: properties, donor atom, denticity • Iron nutrition • Nomenclature • Isomerism of coordination compounds • Structural isomers, ionization, linkage, coordination • Stereoisomerism - geometrical, optical	
Chapter-7	Bonding in complex ions	2 Lectures
	• Crystal-field model • Octahedral complexes - Colour and Spectrochemical series - High- and low- spin complexes	

	-Magnetism Other coordination geometries: - Tetrahedral and square planar	
Chapter-8	Transition metals in biological systems	1 Lecture
	• Abundance of transition metals in humans	

References:

- Stereochemistry: Conformation and mechanism by P.S.Kalsi
- Organic chemistry by Jonathan clayden, nick greeves and stuart warren
- University General Chemistry , 1st edition (2000), C.N. R. Rao, Macmillan Publishers, India ,
- 2. Principles of Physical Chemistry, 4th edition (1965), S.H. Maron and C.F. Prutton, Collier Macmillan Ltd 3. The elements of Physical Chemistry, 5th edition (2009), Atkins P, de Paula J. , W. H. Freeman Publication, USA
- 4. An Introduction to Electrochemistry , edition reprint, 2011, Samuel Glasstone, BiblioBazaar, USA
- 5. Physical Chemistry for biological sciences, 1st edition, (2005), Chang R., University Science Books, USA 6. Physical Chemistry, 1st edition, (2003) David Ball, Thoson Learning, USA.
- 7. Essentials of Physical Chemistry, 24th edition, (2000), B S Bahl, G D Tuli, ArunBahl, S. Chand Limited, India.
- 8. Concise Inorganic Chemistry . 5th edition (2008), Author: J. D. Lee, John Wiley & Sons, USA.
- 9. Organic Chemistry, 6 th edition, (1992), Morrison Robert Thornton, Pearson Publication, Dorling Kindersley (India Pvt. Ltd.)
- 10. Guide book to Mechanism in Org
- anic Chemistry by Peter Sykes, 6 th edition, (1996), Prentice Hall, India.

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Biology 102

Course Name: Cell biology

Teaching Scheme: TH: 3 Hours/Week **Credit: 3C**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic biology from XI & XII Science.

Course Objectives:

- This course will introduce the basic unit of life, or the cell, and its structural and functional elements.
- Students will learn the components of a cells and their functioning, cell division, contribution of a cell to form multicellular units, and flow of genetic information within a biological system through the central dogma of life.

Course Outcomes:

On completion of the course, student will be able to understand the structure and function of each organelles and cell division and central dogma of life

Semester II

Course Contents

Chapter-1	Structure and function of cell components	24 Lectures
	• Membranes • Plasma membrane and glycocalyx • Nucleus • Ribosomes • Endoplasmic reticulum • Plasmodesmata • Golgi and vesicles • Lysosomes • Vacuoles • Mitochondria • Plastids, Chloroplast • Microbodies • Cytoskeleton • Flagella, Cilia • Cell wall	
Chapter-2	Endosymbiosis	4 lectures
	• Chloroplast • Mitochondria	
Chapter-3	Genetic code and central dogma of life	2 lectures
	• Nucleic acids, one gene-one polypeptide hypothesis, • Chromosome structure, DNA synthesis, transcription, translation, protein synthesis, protein targeting and processing	
Chapter-4	Gene expression	2 lectures

	• prokaryotic, eukaryotic, RNA interference	
Chapter-5	Cell division	2 lectures
	• binary, budding, mitosis and meiosis, cell cycle, differentiation, aging, and death	
Chapter-6	Developmental control in multicellular systems	2 lectures
	• stem cells; embryonic development and pattern formation; cells, tissues, andorgans; signaling and developmental controls. Examples from animals andplants.	

Reference:

- Molecular Cell Biology. 7th Edition, (2012) Lodish H., Berk A, Kaiser C., KReiger M.,Bretscher
- A., Ploegh H., Angelika Amon A., Matthew P. Scott M.P., W.H. Freeman and Co., USA
- Molecular Biology of the Cell, 5th Edition (2007) Bruce Alberts, Alexander Johnson,Julian Lewis,
- Martin Raff, Keith Roberts, Peter Walter. Garland Science, USA
- Cell Biology, 6th edition, (2010) Gerald Karp. John Wiley & Sons., USA
- The Cell: A Molecular Approach, 6th edition (2013), Geoffrey M. Cooper, Robert E. Hausman,
- Sinauer Associates, Inc. USA

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Lab 101

Course Name: Practicals in physics

Teaching Scheme: TH: 3 Hours/Week **Credit: 3C**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic physics from XI & XII Science.

Course Objectives:

- Students will be given the basic information of electricity, magnetism and quantum mechanics

Course Outcomes:

On completion of the course, student will be able to–

- Apply the basic knowledge of classical mechanics in day to day life

Semester I

Course Contents

Practicals	Title	No. of practicals
Practical-1	Simple pendulum	1 Practical
Practical-2	Static Friction	1 practical
Practical-3	Frequency of A.C.	1 practical
Practical-4	Plane diffraction grating	1 prcatical
Practical-5	M.I Of flywheel	1 practical
Practical-6	Polarimeter	1 practical

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Lab 111

Course Name: Practical in Chemistry

Teaching Scheme: TH: 3 Hours/Week **Credit: 3C**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic chemistry from XI & XII Science.

Course Objectives:

- To study coordination chemistry of metal complexes
- To study electrochemistry of the reaction
- To study reduction reaction using reducing agents
- To expertize students in biochemical calculations

Course Outcomes:

On completion of the course, student will be able to–

- Study all basic fundamentals of chemistry
- Can extend their analytical thinking in research field.
- Develops practical hand

Semester II

Course Contents

Practicals	Title	No. of Practical
Practical-1	Determination of λmax by colorimetric method	1 Practical
	• To determine λmax and concentration of a given solution of copper sulphate ammonia complex by using colorimertry	
Practical-2	Synthesis of coordination complexes	1 practical
	• To synthesize hexaammine nickel (II) chloride	
Practical-3	Indicator constant by colorimetric method	2 practical
	• To determine indicator constant of given acid base solution using colorimetric method	
Practical-4	Reduction of benzophenone	2 practical
	• To synthesize diphenyl methanol from benzophenone using $NaBH_4$	
Practical-5	Synthesis of coordination compound	2 practical
	• To synthesize hexaammine cobalt (III)chloride	
Practical-6	Potentiometry	1 practical
	• To determine formal redox potential of ferrous/ferric system by using potentiometer	
Practical-7	Determination of cell constant, energy of activation and temperature coefficient	
	• To determine the cell constant by using KCl solution • To determine the temperature coefficient and activation energy of the reaction	

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Lab 121

Course Name: Practicals in Biodiversity

Teaching Scheme: TH: 3 Hours/Week **Credit: 3C**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic biology from XI & XII Science.

Course Objectives:

- To study biodiversity of plants
- To study biodiversity of animals

Course Outcomes:

On completion of the course, student will be able to–

- Identify plants and animals
- Study characteristics of plants and animals and classify them in families and phylum.

Semester II

Course Contents

Practicals	Title	No. of Practicals
Practical-1	Study of Bryophytes	1 Practical
Practical-2	Study of Pteridophytes	1 practical
Practical-3	Study of red and green algae	1 practical
Practical-4	Study of gymnosperms	1 practical
Practical-5	Study of fungi	1 practical
Practical-6	Phylum -Porifera, Cnidaria ,Platyhelminthes	1 practical
Practical-7	Phylum-Aschelminthes,Annelida,Arthropoda	1 practical
Practical-8	Phylum:Mollusca,Echinodermata	1 practical
Practical -9	Phylum: Hemichordata,Chordata (Pisces,Amphibi)	1 practical
Practical -10	Phylum: Chordata (Reptilia,Aves,Mammalia)	1 practical

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

First Year of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Lab 102

Course Name: Practicals in Chemistry

Teaching Scheme: TH: 3 Hours/Week **Credit:03**
Examination Scheme: CIA : 50 Marks **End-Sem : 50 Marks**

Prerequisite Courses: Knowledge of Basic chemistry from XI & XII Science.

Course Objectives:

- To study coordination chemistry of metal complexes
- To study electrochemistry of the reaction
- To study reduction reaction using reducing agents
- To expertize students in biochemical calculations

Course Outcomes:

On completion of the course, student will be able to–

- Study all basic fundamentals of chemistry
- Can extend their analytical thinking in research field.
- Develops practical hand

Semester II

Course Contents:

Practicals	Title	No. of Practicals
Practical-1	Determination of λmax by colorimetric method	1 Practical
	• To determine λmax and concentration of a given solution of copper sulphate ammonia complex by using colorimertry	
Practical-2	Synthesis of coordination complexes	1 practical
	• To synthesize hexaammine nickel (II) chloride	
Practical-3	Indicator constant by colorimetric method	2 practical
	• To determine indicator constant of given acid base solution using colorimetric method	
Practical-4	Reduction of benzophenone	2 practical
	• To synthesize diphenyl methanol from benzophenone using $NaBH_4$	
Practical-5	Synthesis of coordination compound	2 practical
	• To synthesize hexaammine cobalt (III)chloride	
Practical-6	Potentiometry	1 practical
	• To determine formal redox potential of ferrous/ferric system by using potentiometer	
Practical-7	Determination of cell constant, energy of activation and temperature coefficient	
	• To determine the cell constant by using KCl solution • To determine the temperature coefficient and activation energy of the reaction	

Progressive Education Society's

Modern College of Arts, Science and Commerce (Autonomous), Shivajinagar, Pune - 5

FirstYear of B.Sc.Blended (Biosciences)

(2019 Course)

Course Code: Lab 122

Course Name: Practicals in cell biology

Teaching Scheme: TH: 3 Hours/Week **Credit: 03**
Examination Scheme: CIA: 50 Marks **End-Sem: 50 Marks**

Prerequisite Courses: Knowledge of Basic biology from XI & XII Science.

Course Objectives:

- To study mitosis and meiosis in plants
- To study cell counting using haemocytometer

Course Outcomes:

On completion of the course, student will be able to–

- Distinguish between mitosis and meiosis
- Isolate nucleus, mitochondria
- Study characteristics of cells

Semester II

Course Contents

Practicals	Title	No. of practicals
Practical-1	Study of mitosis	1 Practical
Practical-2	Study of meiosis in plant material	1 practical
Practical-3	Observation of cell organelles	1 practical
Practical-4	Cell counting using Haemocytometer	1 practical
Practical-5	Use of Micrometry	1 practical
Practical-6	Isolation of nucleus, mitochondria of lysosomal functions	1 practical
Practical-7	Study of cell lysis	1 practical
Practical-8	Differential white cell count	1 practical